Brief cognitive screening tests for dementia

BRIEF COGNITIVE SCREENING TESTS FOR DEMENTIA: COMPARISON OF THE MINI-MENTAL STATUS EXAMINATION AND THE COGNITIVE SCREENING TEST

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Introduction

Brief cognitive screening tests are used increasingly in clinical and research settings to assess the presence and severity of cognitive impairment in the elderly. When screening tests are used in large scale aging research, their main goal is mostly to identify potential cases of dementia. With this goal in mind, the false negative rate of the screening test is of special interest. The false negative rate can be described as the proportion of incorrect classification within the group of persons having dementia.

In this study we compared Mini-Mental Status Examination (MMSE) (Folstein et al., 1975) and the Cognitive Screening Test (CST) (Deelman et al., 1989) with respect to their ability to discriminate between mildly demented, moderate demented and non-demented patients. The MMSE is a general-purpose cognitive screening test, consisting of 11 items and requiring 5 to 10 minutes to administer. Functions that are tested include orientation, short-term memory, attention, language, calculation and praxis. The CST is derived from the Short Portable Mental Status Questionnaire (Pfeiffer, 1975) and the Mental Status Questionnaire (Kahn et al., 1960). The CST consists of 14 questions concerning orientation in time, date of birth and age, address and current and immediately prior queen of the Netherlands. The tests requires 5 minutes to administer. In contrast to the MMSE, all items of the CST are focussing on memory and orientation. The CST is up to now only in use in the Netherlands.

Methods

116 patients, referred to the outpatient Memory Clinic of the University Hospital of Maastricht, were enrolled as participants in this study. All patients underwent an standardized neuropsychiatric and neuropsychological program, which lasted about four to five hours per patient (Verhey et al., 1989). This program included history taking, physical, neurological and psychiatric examination and also technical examination (e.g. laboratory, EEG or CT). The degree of cognitive decline was assessed by the Global Deterioration Scale (GDS) (Reisberg, 1983). This is a 7-points scale ranging from 'no cognitive decline (score 1) to 'severe cognitive decline'(score 7). Scoring on the GDS is based on the clinical symptomatology. Dementia was diagnosed according to the DSM-III-R criteria (APA, 1987). Level of education was scored according to a 7-points scale ranging from 'no formal education' (score 1) to 'University' (score 7). The patients were divided into four diagnostic categories: moderate to severe dementia (Dem-s, GDS-score $\geq$ 5); mild

dementia (Dem-m, GDS-score 3 or 4); cognitive dysfunctions, but no dementia (Cogn); subjective complaints about memory, but no objective cognitive dysfunctions (Subj). Table 1 shows the characteristics of the study sample.

Results

Differences in age, education and GDS-score were significant between all groups ($p < .001$). Correlations between the CST-scores and the MMSE-scores and age and education were significant. ANOVA with age and education as covariates revealed significant differences in mean MMSE-score and CST-score between the four groups (MMSE: $F = 24.13$, $df = 3;99$, $p < .0001$; CST: $F = 22.40$, $df = 3;99$, $p < .0001$). Using a test for multiple comparisons (Duncan, $p = .01$) we found that the differences between all four groups were significant. The correlation between the MMSE and the CST was .74.

		Dem-s n=18	Dem-m n=32	Cogn n=46	Subj n=20
age	mean	77,6	69,7	68,3	64,6
	SD	7,4	8,0	9,2	9,4
sex	m/f	9/9	16/16	26/20	7/13
education	med.	2,5	4,0	4,0	5,0
	range	1-5 (n=14)	2-6 (n=30)	1-7 (n=43)	2-7 (n=18)
GDS-score	med.	5,0	4,0	2,0	2,0
	range	5-6	3-4	2-5 (n=45)	2-3 (n=18)
CST (2)	mean	6,9	10,5	12,3	13,6
	SD	2,6	2,4	2,0	1,0
	range	3,5-12,5	6-14	5,5-14	10-14
MMSE (3)	mean	16,4	21,3	25,7	27,9
	SD	4,4	3,5	4,3	2,6
	range	8-23	13-29	14-30	20-30

(1) For explanation, see text.
(2) Maximum score CST is 14.
(3) Maximum score MMSE is 30.

Table 1 (1):

Table 2 shows the percentages false negatives (FN) and false positives (FP) in the four groups. Cut-off points as mentioned in the orgininal articles were used: $\leq$ 10 for the CST (Deelman et al., 1989) and $\leq$ 23 for the MMSE (Folstein et al., 1975). The results within the group of moderate to severe demented patients were good, regarding percentages FN of 11% for the CST and 0% for the MMSE. Within the group of mildly demented patients, the results were rather disappointing: percentage FN of 50% for the CST and 25% for the MMSE. The percentages of FP (non-demented patients being incorrectly classified as demented patients) in the COGN-group were 11% for the CST and 18% for the MMSE. In the SUBJ-group these percentages were 5% and 10% respectively.

	Dem-s n=18	Dem-m n=32	Cogn n=46	Subj n=20
CST $\leq$ 10	16	16	5	1
CST > 10	2	16	41	19
Total	18	32	46	20
FP in %	--	--	11	5
FN in %	11	50	--	--
MMSE $\leq$ 23	18	24	9	2
MMSE > 23	0	8	37	18
Total	18	32	46	20
FP in %	--	--	18	10
FN in %	0	25	--	--

(1) For explanation, see text

Table 2 (1):

Discussion

Both the MMSE and the CST were successfull in identifying patients with moderate to severe dementia. However, screening tests are mostly used to identify potential cases of mild dementia. In this respect, both screening tests were less successfull. The CST missed half of the mildly demented patients. The results of the MMSE were better, but still one-quarter of the mildly demented patients was not identified. The somewhat higher sensitivity of the MMSE is probably due to the fact that the MMSE focusses on multiple cognitive functions and not solely on memory and orientation like the CST.

These results confirm what is now more and more recognized in the literature: brief

cognitive screening tests often fail in differentiating mild dementia from normal aging (Ritchie, 1988). Researchers in the field of gerontology should therefore realize that they mostly cannot simply rely on short cognitive screening instruments to indentify all cases of mild dementia.

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